Thermal Expansion

Name: _____ Section: 2AL-___ Date performed: __/__/__

Lab station: _____ Partners: _____

(Q-1,2,3,4) Identify 3 materials by measuring their coefficients of thermal expansion.

Express ΔL in terms of $\Delta\theta$ (in degrees) and the pointer shaft diameter (D).

Show how you intend to calculate α given the data taken from the experiment.

$D =$ _____ $T_{\text{room}} =$ _____

	1	2	3
Sample description*			
Effective tube length (m)			
Initial temperature (°C)			
Final temperature (°C)			
Change in temperature (C°)			
Initial angle (deg)			
Final angle (deg)			
Change in angle (deg)			
Change of length (m)			
Experimental α ( )			
Closest α from table ( )			
Material (from table)			

*Either silver/lightweight, silver/heavier, yellowish, or reddish

Exercises

Explain how you were able to be sure that the final final temperature of the rod was 100°C.

How is the effective tube length, L_0, defined?

(A) L_0 is the full length of the tube.
(B) L_0 is the distance between the input end and the pointer shaft.
(C) L_0 is the distance between the knife-edge support and the lead weight.
(D) L_0 is the distance between the knife-edge support and the far end of the tube.
(E) L_0 is the distance between the knife-edge support and the pointer shaft.

Explain:

Why is the lead weight used?

(A) It keeps the input end from moving.
(B) It acts as the effective end of the tube.
(C) It decreases friction between the tube and the pointer shaft.
(D) It increases friction between the tube and the pointer shaft.
(E) It acts as a heat sink, preventing the temperature of the tube from exceeding 100°C.

What is the relative uncertainty ($\delta L_0/L_0$) of your L_0 measurement (pick one) given that it is measured using a meter stick?

What would the relative uncertainty of your ΔL value be if you were to measure the pointer shaft diameter using the same meter stick? (under such circumstances, it would be safe to assume that $\delta\Delta L/\Delta L = \delta D/D$.)

Considering your answers to the previous two questions, explain why you can get away with measuring L_0 with a meter stick, but the pointer shaft diameter must be measured with a more precise instrument such as the micrometer calipers?